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Plant Divestitures and Acquisitions in the Canadian Manufacturing Sector

by John R. Baldwin, Robert Gibson and Yanling Wang

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*Statistics Canada
Economic Analysis Division
R.H. Coats Building, 18th floor, 100 Tunney's Pasture Driveway
Ottawa, Ontario K1A 0T6

**Norman Paterson School of International Affairs
Carleton University, Ottawa,Ontario

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Authors' names are listed alphabetically.

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Abstract

This paper examines the characteristics of plants in the manufacturing sector undergoing changes in ownership to further our understanding of the underlying causes of mergers and acquisitions. Previous Canadian studies (Baldwin 1995; Baldwin and Caves 1991) compare the performance of merged plants at the beginning and the end of the 1970s. This paper examines annual changes that occurred over the 1970s, 1980s, and 1990s to provide a longer-run perspective. In doing so, it outlines the amount of change taking place (both the number of plants affected and the share of employment) and the characteristics of plants that led to their takeover. Differences between foreign and domestic takeovers are also examined.

Keywords: mergers, foreign takeover, domestic takeover

Symbols

The following standard symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

Executive summary

This paper examines the pattern underlying divestitures and acquisitions (plant control change) in the Canadian manufacturing sector over the 1970s, 1980s, and 1990s. Each year, changes in plant ownership effect renewal in a substantial portion of the industrial population. The average annual percentage of employment affected (4.8%) is larger than either plant entry (2.3%) or plant exit (2.7%) over the time period studied. Moreover, the percentage of employment affected by an ownership or control change has been growing over the period.

Examination of patterns in divestitures and acquisitions is used here to discriminate among the various causes that have been posited to lead to a control change. The paper asks whether plants whose performance had deteriorated were more or less likely to be acquired by others; whether plants that were behind the average, in terms of their performance, were more or less likely to be acquired; and whether acquisitions and divestitures were more likely to occur in certain types of industries—those where intangible assets associated with technology or brands were more prevalent.

The paper also focuses on whether the characteristics of plants that are acquired or divested differ by nationality of the owning firm. In particular, we are interested in whether acquiring firms of different nationalities (foreign as opposed to domestic) target different types of plants.

The paper finds the following.

1) Support for the failing-firm argument is found. For the sample as a whole, control changes were more likely to occur if the relative wage rates paid were falling; however, this tendency originated from foreign firms, rather than domestic (Canadian-owned) firms, and from the divestiture, more than the acquisition side of the control-change process. Foreign firms are more likely to divest plants that begin to lose their capability to pay competitive wages, and to lose market share and profitability. Domestic plants are divested when they begin to gain market share.

2) Control changes do not occur only in those plants that are weaker. On average, ownership change is more likely in larger, older plants where more products are produced, with a greater proportion of non-production workers, and in industries with higher wages and greater capital intensity. All of these characteristics are associated with a set of special capabilities, such as managing capital-intensive production processes, employing relatively high-skilled workers, and having a larger proportion of managers and professionals. These are the conditions that produce a fertile ground into which new ideas can be injected by changes in ownership.

3) Acquisitions and mergers are also more likely to occur when there are fewer plants in the industry—where the industry is more concentrated. Control changes provide an alternative avenue for industry renewal when conditions reduce the amount of renewal that occurs via greenfield entry of new firms. Greenfield entry is effected by the building of a new plant.

4) The probability of divestiture increases for those plants that are not in the core industry of their owning firm. These unrelated plants are 127% more likely to experience a control change than plants that are located in close industrial proximity to their counterparts. Unrelated diversification faces numerous challenges and the higher probability of divestitures here suggests that experimentation— and perhaps failure— is higher in this group.

5) After taking into account differences in industry and plant characteristics, the probability of takeover for a foreign plant is 85% higher than that of a domestic plant. Foreign plants differ substantially from domestic plants in providing a receptive environment for the transmission of knowledge via takeovers.

6) Some similarities exist in the characteristics of plants being shifted from foreign to foreign, and from domestic–to–domestic, firms. Control changes are related in a similar way to age of plant, number of plants per industry, and the distance a plant is from its parent's core business, thereby suggesting that a common set of structural characteristics underlies divestitures across both groups.

7) The importance of the acquired plant's size however, (whether it be the average size before a merger, or the average plant size of the industry, or the number of products produced per plant) matters less in the foreign sector than in the domestic sector. Rationalization motives related to scale and scope economies are less important in the foreign sector, perhaps because the average plant size is already larger, or the skill set that is being sought in a takeover is more idiosyncratic in the foreign sector.

8) There is also a considerable difference in short-run forces influencing divestiture. Foreign plants that begin to lag in several dimensions—market share, wage rates, or profitability— are more likely to be divested. On the other hand, domestic plants use the opportunity of market share gains to shift ownership to new owners.

9) Domestic plants share many characteristics whether they are divested to domestic or foreign firms, —except that foreign firms look for these plants more intensively within sectors whose firms possess intangible innovation and brand assets: the product-differentiated and the science-based sectors. This is consistent with the argument that knowledge is more embedded in firms than in sectors and that multinationals embed certain forms of knowledge, whether they are in sectors where this is more widespread or in sectors where this is less common.

10) It is in the transfers from the foreign to the domestic sector that the largest differences can be found. Few of the characteristics that generally underlie control changes elsewhere are significant for these types of control changes. These types of divestitures occur more frequently in the labour-intensive and natural resource-based sectors, where foreign firms were withdrawing over this time period. In the case of control changes here, many of the significant variables differ in a meaningful way from their counterparts in the other three categories. (Foreign to foreign; domestic to foreign and domestic to domestic).

1 Introduction

To further our understanding of the underlying causes of divestitures and acquisitions, this paper examines the characteristics of plants in the Canadian manufacturing sector that undergo control changes.

Changes in plant ownership occur to create value for the acquiring firm. Earlier research that uses Canadian manufacturing data finds value creation, particularly in industries that involve embedded knowledge (Baldwin and Caves 1991).

The changes that create value can come from many sources. On the one hand are the structural changes within industries that lead to new opportunities for those who recognize changes and reorganize the production process to exploit them. On the other hand, economies of scale at the plant level may drive consolidation within an industry. Taking advantage of cross-country differences in costs may drive international mergers via foreign direct investment.

Control changes are also occasioned by the individual idiosyncratic differences between firms that are constantly emerging as a result of changing competencies at the firm level, and those that are exploited by combining the assets of different firms. Firms develop skills which when combined with those of other firms create more value than is contained in the separate individual firms.

Some of this occurs because of failings on the part of those plants being acquired. At any point in time, the population of firms divides into those that are growing and those that are declining. These differences stem from entrepreneurial and managerial differences in competencies. The competitive process causes some firms in decline to exit and others to transfer assets via control changes to those firms that are better able to make use of them. Competition for resources in asset markets puts pressure on management that can no longer compete.

Others (Jensen 1988), have focused on whether it is the financial environment that conditions merger activity by focusing either on balance sheet issues or the overall macroeconomy. In this paper, we focus elsewhere: on the operating characteristics of the entities that are divested, acquired or merged as a result of control changes (wage rates, size, knowledge intensity, productivity, profitability, age, and diversity of product line).

To shed light on the nature of the process that shifts control from one owner to another, we use data on all Canadian manufacturing plants from 1973 to 1999. We examine whether the characteristics that are often posited to lead to the type of synergies produced by mergers are present in plants undergoing an ownership change.

We also focus on whether these characteristics differ by nationality of the owning firm. In particular, we are interested in whether acquiring firms of different nationalities target different sets of plants. Both plants and firms are heterogeneous. They differ substantially in terms of the technology being used, the amount of human capital employed, and the amount of intangible capital used for innovation. While we will employ a substantial number of characteristics (such as plant size, wage rates, productivity, profitability, and management intensity) to ask which plants tend to be acquired, there are a number of characteristics that we cannot measure, especially in the area of intangibles.

The profiles for foreign multinationals operating in Canada are substantially different from domestic (Canadian-owned) firms. Much of the difference comes in the form of firm-specific intangible assets. Foreign firms tend to be more productive, pay higher wages, and be more innovative (Baldwin and Gu 2005) because of these special capabilities.[1] Therefore, the division of all plants operating in the Canadian manufacturing sector into domestic and foreign-owned allows us to examine differences in merger probabilities of plants that differ in these domains. Earlier work by Baldwin and Caves (1991) finds evidence to suggest that mergers involving foreign and domestic plants are characterized by different results and may be caused by different factors.

We conduct a series of analyses using the domestic–foreign taxonomy. We first analyze whether there are systematic differences in plant characteristics that allow us to differentiate between takeovers within the foreign-controlled sector and takeovers within the domestic-controlled sector. We then ask whether there are differences in plant characteristics within each group that are transferred to ownership in the other group. To this end, we examine four different combinations of ownership change—from domestic to domestic ownership (DD); from domestic to foreign ownership (DF); from foreign to domestic ownership (FD); and from foreign to foreign ownership (FF).

The paper is organized as follows: Section 2 discusses the data; Section 3 outlines the size and types of control changes; Section 4 describes the analytical framework that is adopted; Section 5 reports the results, and Section 6 concludes the paper.

2 Data description

Our data are unique in terms of the comprehensiveness of coverage of a population, the length of time covered, and the nature and accuracy of firm identifiers that are used to measure control changes. The data come from the Census of Manufacturers (now the Annual Survey of Manufactures and Logging), conducted and maintained by Statistics Canada.[2] The file for 1973 to 1999 has a constant industry classification over this period, which allows us to study the impact of industry characteristics on a consistent basis.[3]

A longitudinal database has been created from the annual data with plant and firm identifiers that allow for detailed studies of population dynamics. The plant identifiers were created to prevent changes over time caused by control changes and this allows for accurate depiction of the plant birth and growth process.[4]

The firm identifiers were taken from Statistics Canada's Business Register, which is maintained annually and allows plants to be grouped by owning enterprise, either within industries or across

1. Similar results have been reported for the United States (Doms and Jensen 1998), the United Kingdom (Conyon et al. 2002) and Indonesia (Takii 2004).
2. During the period, the file was essentially a census of all plants—with the smallest plants being covered with administrative tax files. It is only post-2003 that the file has become a sample survey.
3. For further descriptions of the file, see Baldwin (1995) and Baldwin, Beckstead and Girrard (2002).
4. Ibid.

the manufacturing sector.[5] Special attention was given to verifying that changes in business numbers in the Business Register coincided with changes in firm ownership. The enterprise identifier changes when effective control of the firm passes from one legal entity to another. The enterprise identifier is constructed at the level of all firms under common ownership in the Canadian economy—not at a lower legal entity level.[6]

The database links plants to firms and allows us to track movements of plants from one owner to another. Sometimes these changes are associated with the merging of two separate entities into one new firm: when the old firm disappears and a completely new one appears. At other times, plants will be spun off to a new legal entity while the original owner continues operations with other plants. In still other cases, the divestiture will be done by a firm that continues in existence, and the plant is transferred to a firm that was already in existence. Table 1 summarizes the number of control changes that have occurred in each of these areas. Over the entire period, there are 17,781 control changes available for analysis. The majority (12,832) are associated with the disappearance of the entity that divests itself of a plant while 7,255 plants are acquired by a completely new entity. This latter category contains those changes that most closely resemble a traditional merger, where plants from various entities are combined to form a new entity. It is clear though, that a large number of transfers take place between entities that continue to exist both before and after the divestiture. In this study, we will be examining all control changes taken together.

Table 1
Control changes, 1973 to 1999

	All control changes		
	Plant acquisition		Total
Plant divestiture	By continuing firm	By new firm	
	number		
By continuing firm[1]	2,284	2,665	4,949
By exiting firm	5,577	7,255	12,832
Total	7,861	9,920	17,781

1. A continuing firm is one that does not change ownership and that has at least one plant over two periods.
Source: Longitudinal Manufacturing Research Database, Statistics Canada.

3 The intensity of control changes

Control change needs to be set in the context of the wider dynamics that consistently change the face of the business population. Every year, substantial employment is shifted from one plant to another as a result of growth and decline in the producer population. Some incumbents lose market share; others gain market share. New plants are created and existing plants are closed down.

5. Because of the care taken to maintain both plant and firm identifiers and the annual coverage of the survey, this file offers much better coverage than some others that have been used to study the impact of mergers. Other studies – (McGuckin and Nguyen 1995; Lichtenberg and Siegel 1992) – use the U.S. Longitudinal Research Database (LRD), the disadvantage being that neither the frame nor the register was kept up to date on an annual basis. Because of the difficulty in creating longitudinal firm identifiers, many of the LRD studies have been restricted to individual industries like food or meat-packing.

6. International comparisons need to be cognizant of the fact that firm identifiers can be defined at different levels – a first-level legal entity or a higher-level consolidated entity. Differences exist across countries in this practice that are often linked to differences in legal systems and practice.

This process moves slowly but inexorably through time. Examining the period from 1960 to 1999, Baldwin and Brown (2004) report that on average around 40% of jobs in the manufacturing sector that existed at the beginning of each 10-year time frame during the period, disappeared by the end of the 10-year period, either because plants declined, in terms of employment or because they were closed. A similar percentage of jobs over each decade are 'created' by growth in employment in incumbent plants or, by the birth of new plants. Therefore, over a relatively short period of time, about two in every five jobs are eliminated, either because of plant closures or downsizing by incumbents and are, in turn, renewed. A larger proportion of jobs are renewed when a longer time frame is examined. For instance, using a 20-year time frame, over 65% of jobs in the manufacturing sector are renewed; over a 30-year period, job renewal amounts to just over 75%; and over a 40-year period, just over 85% of jobs are renewed.

Control changes involve a different type of renewal: the transfer of plant ownership from one owner to another. Annual rates of renewal that arise from the plant exit and opening process are compared to the rates of change that arise from control shifts in Table 2. Annually, some 2.7% of employment can be found in plants that are about to be closed; a little less can be found in plants that have just been opened. It is noteworthy that the percentage of employment affected by control change on an annual basis (4.8%) is larger than either plant entry (2.7%) or exit (2.3%) over the entire time period studied.

Table 2
Plant control, plant closure, plant entry and annual rates of change, 1973 to 1999

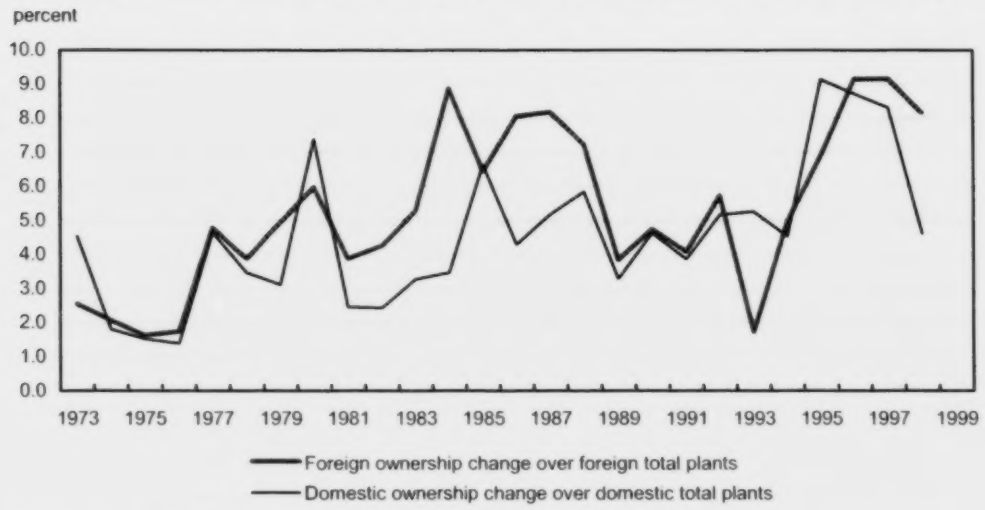
	Using share of employment	Foreign rate using total employment	Domestic rate using total employment	Foreign rate using just foreign employment	Domestic rate using just domestic employment
			percent		
Closed plants	2.7	0.6	2.0	1.8	3.1
New plants	2.3	0.4	2.0	1.1	3.0
Control change	4.8	2.0	2.8	5.7	4.3

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Since our interest in this paper lies also in differences between the domestic and foreign populations, rates of entry, exit and control change are presented for both populations. These are calculated relative to all plants (data columns 2 and 3), foreign plants only (data column 4), or domestic plants only (data column 5). Plant exit rates are considerably lower for the foreign than for the domestic segment, whether we use the rate calculated against the entire population (0.6% versus 2.0%) or the subpopulations of reference (1.8% versus 3.1%). Similar relative differences between the foreign and domestic segments can be found for plant entry rates.

In contrast, the rate of control change is relatively higher for foreign plants. In particular, a larger percentage of foreign plants experience a control change (5.7%) than do domestic plants (4.3%) over the entire period.

Figure 1
The importance of plant ownership change as a share of total employment

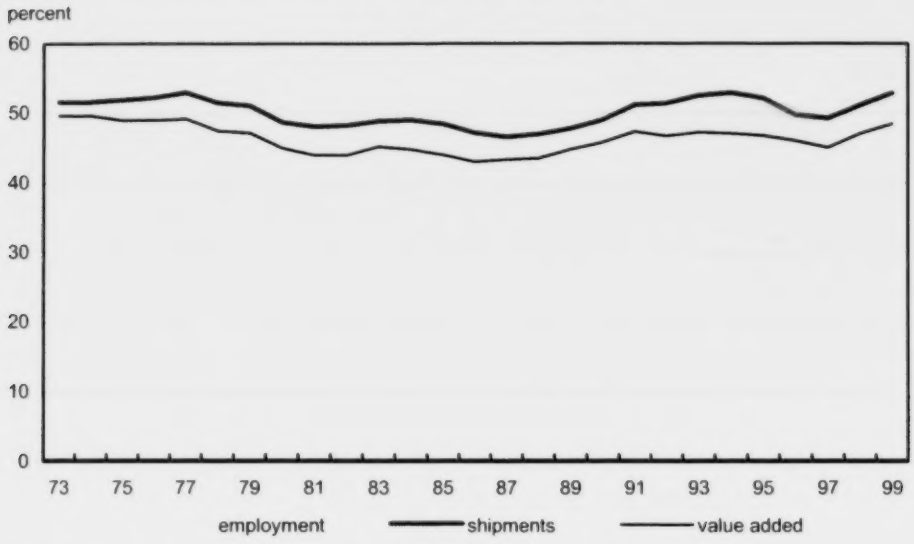


Source: Longitudinal Manufacturing Research Database, Statistics Canada.

It is noteworthy that the rate of control change has been increasing over time (Table 3), in both the domestic and foreign sectors, with similar and discernible patterns in both (Figure 1). Peaks of activity occur in the mid-1980s and the mid-1990s, both midpoints in decade-long business cycles.

Despite differences in the amount of turnover from different sources in the domestic and the foreign sector, the relative importance of foreign-owned firms in the manufacturing sector has remained relatively constant. Since 1973, the percentage of shipments accounted for by foreign-controlled firms has been around 50% (Figure 2). While shipments dipped slightly in the middle of the period, in response to a regulatory regime that placed more restrictions on incoming foreign investment flows (Baldwin and Gellatly 2005), they regained earlier levels by 2000. Therefore, the foreign presence in the Canadian manufacturing sector is both large and mature. While changes in the percentage of shipments accounted for by foreign-controlled plants occurred within certain sectors, the overall foreign penetration rate remained relatively constant over this time period.

Figure 2
Percentage employment, shipments and value-added of foreign-controlled establishments in manufacturing



Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Table 3
Annual rates of plant control change, 1973 to 1980, 1981 to 1989 and 1990 to 1999

Period	Using share of employment	Foreign rate using total employment	Domestic rate using total employment	Foreign rate using just foreign employment	Domestic rate using just domestic employment
			percent		
1973 to 1980	2.9	1.0	1.9	2.5	3.2
1981 to 1989	5.1	2.2	2.9	6.6	4.3
1990 to 1999	5.8	2.4	3.4	7.2	5.1

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Although the manufacturing population is being changed continuously by both the creation of new plants and control changes, these two forces generally operate in different parts of the size distribution and in different industries. New and closed plants are, on average, less than 40% the size of all plants (Table 4). Plants subject to control change are 226% the size of the average plant. The relative size difference between new plants and those undergoing control changes also holds for foreign and domestic populations, although the difference between plants undergoing control changes and entry and exit is larger for the domestic sector than the foreign sector.

Table 4
Control changes versus entry and exit, by relative size of plants, 1973 to 1999

Relative plant size	1973 to 1999
	ratio
All plants undergoing control change	2.26
New plants	0.40
Closed plants	0.37
Foreign plants undergoing control change	2.79
New foreign plants	1.31
Closed foreign plants	1.49
Domestic plants undergoing control change	1.91
Domestic new plants	0.35
Domestic closed plants	0.29

Note: Ratios were calculated as weighted average across all plants in each year of period and averaged over the period 1973 to 1999.
Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Foreign and domestic firms tend to operate in different parts of the firm size distribution. While domestic firms owned some 89% of all plants from 1976 to 1996, they accounted for only 53% of shipments (Table 5). Foreign-owned plants accounted for only 11% of all plants but 47% of shipments. Foreign-owned plants were relatively larger. Dividing each industry by its median plant size, domestic plants' share of both plant numbers and shipments was considerably higher for plants below the median than above. The reverse was true of foreign-owned plants.

Table 5
Relative importance of foreign and domestic plants, 1976 to 1996

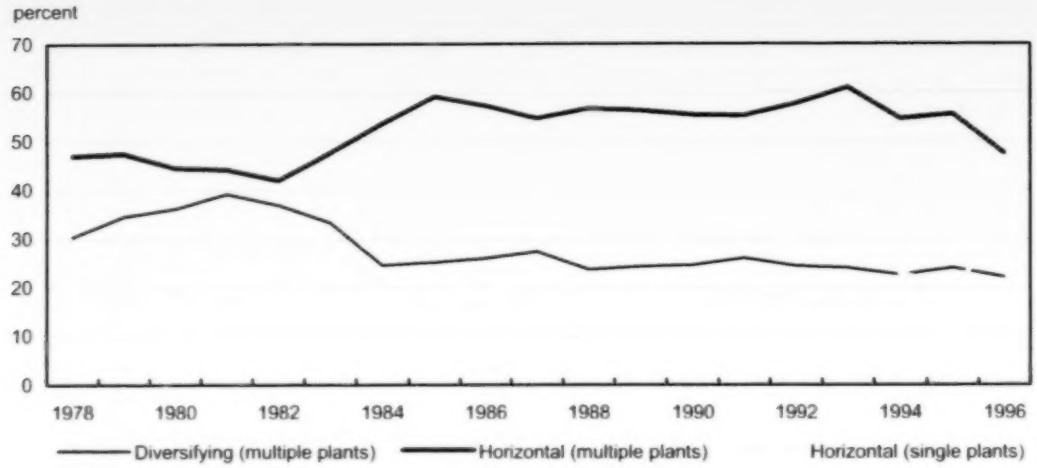
	Total		Below median plant size		Above median plant size	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
			percent			
Share of plants	89	11	95	5	83	17
Share of shipments	53	47	66	34	52	48

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Control changes in this study may involve acquisitions by companies that are either in the same industry or other industries. Control changes in the same industry are horizontal in nature. Control changes in other industries involve diversification across industry boundaries. Horizontal mergers potentially involve the exploitation of scale economies by combining production within an industry. Diversification brings new entrants into an industry, and may exploit either firm-level economies or supply-chain complementarities.

The share of total shipments for horizontal, as opposed to diversified, mergers is plotted in Figure 3 for the period 1976 to 1996. Horizontal mergers are defined as those between firms that have plants in the same 4-digit industry. This category is divided into those acquirers that possessed only a single plant and those with multiple plants.

Figure 3
Horizontal and diversified mergers as share of total shipments in plants being merged



Source: Longitudinal Manufacturing Research Database, Statistics Canada.

4 The framework

4.1 Merger drivers

Empirical studies of mergers have chosen several different frameworks to inform their investigations of the reasons for control changes.

The managerial-discipline approach (Meade 1968) treats takeovers and mergers as a form of natural selection, resulting in the replacement of poor management, as inefficient plants are taken over. If this motive dominates, acquisitions will be driven by the attempt to reform inefficient firms. Takeover targets will be among the less efficient because of entrenched management control or unforeseen events. Attempts to verify this hypothesis tend to look for variables that suggest inefficiency or failure—and define these as plants with either sub-par or deteriorating performance. Evidence is sought that plants are more likely to experience a control change if they are behind others (based on some metric) or are falling further behind (a concept of relative deterioration).

Other approaches offer a more general hypothesis of value creation through mergers. For example, the synergy hypothesis states that acquisitions create a new hierarchical group that is greater than the sum of the values of the independent firms. Nguyen and Ollinger (2006) argue that one of the objectives behind ownership change is an improvement in operating efficiency. In a similar vein, the matching theory (Lichtenberg and Siegel 1987, 1990) posits that changes in ownership are driven by enterprises looking for a better match to improve their performance. Once again, this theory has been used to suggest that the less efficient are more likely to be acquired (McGuckin and Nguyen 1995). To assess the importance of the failing or disciplining motive for acquisitions and divestitures, we too will ask if being behind others, or falling further behind, leads to mergers.

Both the matching and synergy approaches are compatible with a finding that mergers generally occur between relatively successful plants whose union would be even more successful. The synergy approach posits that acquisitions take place when it is expected that the value of the combined new hierarchical firm group to be created by the acquisition will be greater than the sum of the values of the individual firms. In this scenario, it may be that acquiring firms tend to target productive and efficient firms that have technical and brand-special assets (Nguyen and Ollinger 2006). McGuckin and Nguyen (1995) consider ownership change to be motivated by a desire to acquire operating efficiency in ways other than by simply improving managerial discipline.

Investigations of mergers involving multinational firms have also focused on value creation that is related to the special assets possessed by multinationals. These studies start by recognizing that multinationals possess special assets making them superior to domestic firms in many respects (Markusen 1995).[7] These characteristics are derived from embedded assets in the form of intangible assets—technological, marketing or organizational knowledge—that are best exploited abroad, not through arm's-length transactions (the sale of expertise), but through foreign production (Caves 1996). A combination of special advantages, some of which are intangible and country-specific, leads to foreign direct investment (Dunning 1977).

Foreign multinationals can enter a foreign market through greenfield entry or acquisition, and the choice of the mode will depend on several factors, including risk, size and experience (Caves 1996, Chapter 3). The foreign multinational that buys a local firm to enter the market also buys access to a stock of valuable information, including local management familiar with the national market environment and other forms of expertise that may complement its own.

The model of asset-seeking foreign direct investment (Wesson 1999) extends this approach by arguing that foreign firms attempt to create advantages for themselves through acquiring and internalizing valuable assets in the host nation. Buckley and Casson (1998) also use the 'internalizing' approach to foreign direct investment, and compare a wide range of alternative strategies for foreign market entry. They argue that entry by acquisition is likely to be favoured when there are high costs of learning about the foreign market, and high costs of competition in the host market. Greenfield investment increases local capacity and intensifies competition.

Implicit in much of the synergy-enhancing explanations of the merger process is the implicit or explicit assumption that the difference in the characteristics of a plant and the average value of this characteristic across the entire distribution of plants provides a signal of the degree of inefficiency or synergy available to be corrected or exploited via a control change. In a world of heterogeneous agents, synergies may exist between competitors within segments, and these segments may consist of plants that resemble one another. If this is the case, smaller plants may combine with other smaller plants or larger plants with one another. In this case, opportunities for value creation from acquisition and divestiture may be present across almost the entire continuum of plants, whether they are ranked by size or some other characteristic.

The notion that takeover targets are likely to possess certain assets that facilitate knowledge transfer is relevant to takeovers by both foreign and domestic firms. Control change often involves the expansion of a firm—either horizontally or into new industries. Whether this

7. Baldwin and Gu (2005) point out that Canadian multinationals tend to be larger, more capital intensive, pay higher wages, and be more likely to be more innovative.

expansion involves a multinational or a domestic firm, these control changes facilitate the transfer of information, and either should be expected to search for host firms that allow that knowledge to be best exploited. Therefore, it is likely that there will be similarities in the characteristics of plants experiencing a takeover by both foreign and domestic firms.

This paper examines the extent to which the characteristics of plants undergoing control changes accord with the management discipline model and the synergy hypothesis, as outlined earlier. In order to assess the importance of the 'failing' or 'disciplining' motive, the study asks whether deteriorating performance leads to mergers and acquisitions in order to assess the importance of the "failing" or "disciplining" motive. It also investigates how plants undergoing control changes compare to the average non-acquired plant using a broad set of characteristics—ranging from size to knowledge characteristics—in order to determine the characteristic set that attracts takeovers. Finally, it examines whether there are some industry characteristics that matter since they may provide an additional dimension that captures the potential or the need to consummate entry or firm expansion via takeovers. Of course, there may be special technological circumstances that lead on occasion to mergers at the industry level.[8] In this analysis, plants are separated into those owned by Canadian firms and those owned by foreign firms. Differences in the determinants of control changes in each population and across subsets (from domestic to foreign and vice versa) are investigated.[9]

4.2 The analytical framework

Our objective is to examine the characteristics of divested or acquired plants in order to shed light on the underlying causes of plants' control changes. Acquirers are assumed to search for potential acquisition targets based on some metric (usually presumed to be expected value) and denoted here by v. The value of v that comes from a change in control is determined by a combination of plant and owning-firm characteristics, and industry-level metrics. Let the value of v for plant i at time t be defined as:

$$v_{it} = \beta X_{it} + \gamma Y_{kt} + \lambda Z_{jt} + \varepsilon_{it} \ , \tag{1}$$

where X is a vector of plant-specific attributes of plant i at time t, Y is a vector of attributes specific to the owning firm (indexed by k), Z is a vector containing the characteristics of the industry in which the plant is located (industry is indexed by j), and ε is a random error term capturing unobserved influences.

Acquirers are assumed to choose to acquire plant i at a given point in time if the expected value is greater than an unobserved critical level, say, ϖ_{it}.

The probability that a plant is acquired is thus defined as the probability that $v_{it} \geq \varpi_{it}$.

$$\Pr(OC = 1) = \Pr\left(\beta X_{it} + \gamma Y_{kt} + \lambda Z_{jt} + \varepsilon_{it} \geq \varpi_{it}\right), \tag{2}$$

8. Jarrad (2005) finds that regulatory and technological shocks drive industry merger waves.
9. If a foreign firm takes over a Canadian-owned plant to enter the Canadian market, it is often referred to in the literature as acquisition foreign direct investment.

where OC=1 denotes an ownership change, and 0 otherwise. Rewriting (2) leads to

$$\Pr(OC = 1) = \Pr ob\left(\beta X_{it} + \gamma Y_{kt} + \lambda Z_{jt} \geq \varpi_{it} - \varepsilon_{it}\right). \tag{3}$$

The choice of the statistical model depends on the form of the residuals. If the cumulative distribution is normal, then the probit is the appropriate choice; if it conforms to a logistic function, the logit model is appropriate. For practical purposes, the differences are usually small and here it is assumed that $(\varpi_{it} - \varepsilon_{it}) \sim N(\mu_t, \sigma^2)$.

Equation (3) can then be re-written as:

$$\Pr(OC = 1) = \Pr\left(\varpi_{it} - \varepsilon_{it} \leq \beta X_{it} + \gamma Y_{kt} + \lambda Z_{jt}\right) = \Phi\left(\frac{\beta X_{it} + \gamma Y_{kt} + \lambda Z_{jt} - \mu_t}{\sigma}\right), \tag{4}$$

where $\beta, \gamma, \lambda, \sigma$ are constants, μ_t is a year-specific constant and Φ is the cumulative normal distribution.

The variables that are used fall into three different groups:

- a plant's change in performance just prior to merger,
- its longer-run performance, and
- the characteristics of the industry in which it is located.

Each of these sets is discussed separately.

4.2.1 Plant measures of performance: Changes prior to takeover

The first set of variables captures short-run performance characteristics of the plant. Here we examine the nature of previous performance of a plant to test the managerial discipline hypothesis: that plants with a deteriorating performance are acquired to take advantage of opportunities to turn performance around. Since it is not clear what the time period is over which management can deteriorate before the market acts as a disciplinary force, two different time periods were examined: the previous three years and one prior year. Very short (one-year) measures of change performed slightly better in the analysis and are reported here.

Several measures of performance are available:

- the knowledge intensity of the plant
- its relative size
- its wage rate, and
- its profitability.

Each of these is measured relative to the four-digit industry mean of the industry in which the plant is located, and is defined as 'the difference between the performance in the present period (over which control change may or may not occur) and the performance one year before'.[10] Reductions in knowledge intensity provide a signal of the deterioration in a key asset of large

10. We make use of our variables in relative form to deal with the lack of special price data for each plant. A similar methodology is employed in Christensen, Cummings and Jorgenson (1981), Olley and Pakes (1992), Bartlesman and Dhrymes (1994), Baily, Campbell and Hulten (1992), Baldwin and Gorecki (1991), and McGuckin and Nguyen (1995).

plants. Reductions in relative plant size are an indication of a loss in market share. Reductions in relative average wage rates provide a signal that plants are losing their competitiveness in labour markets. Reductions in profits directly affect the well-being of shareholders. Deterioration in any or all of these measures of performance may provide signals to acquirers of potential gains from mergers.

All measures of performance were employed together in this analysis. If the disciplinary motive for mergers is important, they should have negative signs. On the other hand, if firms use these characteristics as signals of strength that may that may lead to additional gains in a synergistic merger, they will be associated with positive coefficients.

The following variables are used:

$\Delta Rel_NL_L_1_0$: changes of a plant's ratio of non-production to total workers relative to its industry mean—a measure of the change in the knowledge capabilities of the plant.

$\Delta Rel_L_1_0$: changes of a plant's employment size relative to its industry mean—a measure of the change in market share.

$\Delta Rel_WR_1_0$: changes of a plant's wage rate relative to its industry mean—a measure of the change in a plant's ability to compete in labour markets.[11]

$\Delta Rel_PR_1_0$: changes of a plant's profit rate (value added[12] minus wages and salaries divided by value added) relative to its industry mean—a measure of a change in the plant's profitability.

All changes are defined as the difference in the performance in a particular year minus its performance one year before.

4.2.2 Plant measures of performance: Levels of plant characteristics

The second set of variables relates to the level of certain plant characteristics. These variables capture the extent to which certain types of assets are being chosen for synergy. We start with relative plant size, which is a general proxy for the types of competencies that allow some plants to grow. Large plants enjoy economies of scale. Large firms possess assets that allow them to organize and control large-scale production. They also differ substantially in terms of knowledge base. They are more likely to be innovative, to perform research and development (R&D), and to have a science-based workforce. These characteristics suggest the type of embedded knowledge capabilities that are sought by mergers where the primary objective is the transfer of knowledge. We also include the number of products produced in order to capture the potential for scope economies at the plant level. If these characteristics are associated with greater synergies, the coefficients will have a positive sign.

While size is a general proxy for competencies that may provide synergies for a merger, we also include a specific variable: the knowledge intensity of the plant, as proxied by the ratio of non-

11. The average wage rate was calculated using both production and non-production workers. Use of production workers alone produced qualitatively similar results.
12. Value added in the Census of Manufactures (now the Annual Survey of Manufactures and Logging) is the value of sales minus the value of purchases of intermediate goods and energy.

production workers to total employment. Non-production workers make up the management and professional group that co-ordinates production. A high-knowledge base should be associated with the type of assets that provide synergies from control changes and is expected to have a positive sign.

'Age of plant' is also used as a proxy for the same characteristics. Older plants have built up experience and knowledge from cumulative production experience and this variable is therefore expected to have a positive sign.

Finally, we include the distance that a plant is separated from its parent. Firms often expand across industry boundaries as part of a diversification process. These mergers tend to be the least successful (Lecraw 1984), and, therefore, may be more vulnerable to takeover because they are worth more in the hands of those firms that have more experience in the industry or because they involve more experimentation and are more likely to fail. We include a binary variable that takes on the value of '1' if a plant is owned by a firm whose primary activity is in another four-digit industry. Based on research on the performance of unrelated diversification, it is expected to take on a negative sign.

The following variables are used:

Rel_NL_L_1_3: a plant's ratio of non-production to total workers, relative to its industry mean, averaged over three previous years. A three-year average is used to smooth out annual fluctuations in a plant's relative performance.

Rel_L_1_3: a plant's size in terms of total employment relative to its industry mean, averaged over the prior three years.

Age: a plant's age for those plants that came into existence after 1961.

Plant_1961: a plant's age for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.

No of Product: the measure of a plant's product diversification, calculated as the product number's equivalent, using a Herfindahl measure of a plant's product diversification.[13]

Unrelated: a binary variable to capture a related or unrelated merger/acquisition. It takes on value of '1' if the acquired plant is owned by a firm whose primary activity is in another industry and '0' otherwise.

4.2.3 Industry variables

The third set of variables are industry characteristics that control for the fact that some industries contain more of the types of plants that offer greater synergy possibilities. Baldwin and Caves (1991) argue that certain industries (science-based and scale-based) contain plants whose

13. See Baldwin, Beckstead and Caves (2002) for a study of plant level diversification and a discussion of the Herfindahl measure of product diversification.

knowledge is embedded in the plant and where control change is the method by which new knowledge is best combined with old knowledge via control changes.

While industry effects could be captured with industry binary variables, we prefer a more informative approach. Therefore, we have included industry characteristics such as relative industry plant size, relative industry non-production worker intensity (a proxy for knowledge intensity), and relative industry wage and profit rate. In each case, the industry characteristic is measured relative to the manufacturing average. The probability of takeover should be positive for each of these characteristics if they act as proxies for both specific industry characteristics in addition to plant characteristics that facilitate synergies from takeover.

In addition, we include an industry variable that captures the number of plants in an industry. This measures the intensity of competition in an industry or the ease of entry through the alternate means of greenfield plant creation. The number of plants in an industry is inversely related to the difficulty of entry and expansion, via plant creation, and is expected to be negatively related to the probability of takeover. Where there are few plants, entry is more likely to be accomplished via takeover than by greenfield expansion since the former has less effect on capacity and therefore less of a depressing effect on prices.

Finally, we recognize that there may still be some industry effects that are not captured with the above industry characteristics, and so we include a set of industry binary variables. Even here, we inform our choice of industry groupings from previous research that has divided four-digit industries into five major industry groupings,[14] each defined primarily on the basis of the factors that influence the process of competition:

1. natural resource-based industries: The primary determinant of competitive success is access to abundant natural resources.
2. labour-intensive industries: The primary determinant of competitive success is labour costs.
3. scale-based industries: The primary determinant of competitive success is the length of production runs.
4. product–differentiated industries: The primary determinant of competitive success is an ability to target production to the demands of various markets.
5. Science-based industries: The primary determinant is the application of scientific knowledge.

Product-differentiated and science-based industries rely on intangible brand and knowledge assets.

The following are the actual variables used:

Ind_Rel_L: industry average plant size (employment) relative to average plant employment size in the manufacturing sector.

Ind_Rel_NL: industry ratio of non-production workers to total workers, divided by the manufacturing non-production worker to total employment ratio.

Ind_Plant: number of plants in an industry.
Ind_Rel_WR: industry wage rate relative to the mean wage rate in all manufacturing.

14. See Baldwin and Rafiquzzaman (1994) for a discussion of the methodology used to create these groupings.

Ind_Rel_PR: industry profit rate (value added minus wages and salaries, divided by value added), relative to the mean of the same ratio in all manufacturing. It should be noted, that on a cross-industry basis, this variable is primarily related to cross-industry differences in capital intensities.

IND: industry or sectoral binary variables.
IND1: natural resource-based industries.
IND2: labour-intensive industries.
IND3: scale-intensive industries.
IND4: product-differentiated industries.
IND5: science-based industries.

IND3 is the omitted category in the regressions.

The estimation equation is:

$$\begin{aligned}\text{Prob}\left(OC_{ikjt}=1\right) = {} & \alpha + \beta_1 \text{Rel_NL_L_1_3}_{ikjt} + \beta_2 \text{Rel_L_1_3}_{ikjt} + \beta_3 \text{Age}_{ikjt} \\ & + \beta_4 \text{Plant_1961} + \beta_5 \text{No_of_Product}_{ikjt} + \beta_6 \Delta\text{Rel_NL_L_1_0}_{ikjt} \\ & + \beta_7 \Delta\text{Rel_L_1_0}_{ikjt} + \beta_8 \Delta\text{Rel_WR_1_0}_{ikjt} + \beta_9 \Delta\text{Rel_PR_1_0}_{ikjt} \\ & + \beta_{10} \text{Unrelated}_{kjt} + \beta_{11} \text{Ind_Rel_L}_{jt} + \beta_{12} \text{Ind_Rel_NL}_{jt} + \beta_{13} \text{Ind_Plant}_{jt} \\ & + \beta_{14} \text{Ind_Rel_WR}_{jt} + \beta_{15} \text{Ind_Rel_PR}_{jt} + \sum_{j=1} \lambda_j \text{OECD}_j + \varepsilon_{ikjt}, \end{aligned} \tag{5}$$

where *i*, *k* and *j* indicate plant, firm and industry, respectively, and *t* is for year.

Due to the inclusion of a set of industry variables that are repeated across the individual plant observations, the regression analysis uses robust clustering techniques on the industry variables.

Control changes are divided into the following four sets in order to investigate the differences across nationality types:

1. domestic firms taking over other domestic-owned plants (DD)
2. foreign firms taking over domestic-owned plants (FD)
3. foreign firms taking over other foreign-owned plants (FF)
4. domestic firms taking over foreign-owned plants (DF).

The distribution of ownership changes within and between nationality groups used in the analysis is presented in Table 6. Control changes occur most frequently within domestic-owned plants (47%), and within foreign-controlled plants (24%). There were slightly more foreign firms acquiring domestic plants (15%) than there were domestic firms acquiring foreign plants (14%).

Table 6
Nationality of control change

	Buyer		Total
Seller	Domestic	Foreign	
	percent		
Domestic	47	15	62
Foreign	14	24	38
Total	61	39	100

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

To avoid the possibility that our empirical results might be driven by aberrant observations, those plants that have statistically exceptional estimates of the performance change variables have been removed. We are using raw microfiles that are collected as part of the process that feeds the National Accounts with data for its Input–Output system. The microfiles are only edited to catch unusual aggregates at the industry level. Rather than imposing our own detailed edit routines for all plants, we exclude those plants in the groups at the bottom or top 1% of the population for each change in relative plant size and wage rate variables. We exclude the top and bottom 2% of the population for the changes in relative profitability. We also excluded plants where there was a gap of data in the file between the divestiture and the acquisition because of the likelihood that this involved simply a lag in data collection during the time of ownership transition. After these edits were made, 524,063 plants with usable observations on the entire set of variables used remain in the sample: of these, 11,117 undergo control changes.

Table 7 provides a comparison of the summary statistics (means) for the population in each class across the foreign/domestic ownership change dichotomy. Compared to plants of the same nationality not undergoing a control change, plants that are divested in the categories of DD and DF are larger, have a larger proportion of non-production workers, are older, have more product lines, and are more likely to be found in industries that are unrelated to their parent firms' primary industry. In addition, they are more likely to operate in industries that on average have larger plant size, higher ratios of non-production workers, higher wage rates, and higher profit rates. For the foreign sector, plants that are divested in the FF category share most of these differences in the DD comparison, with the exception of the industry wage rate. Compared to foreign plants with no ownership changes, plants in the FD category share, with few exceptions, most of the differences in the FF category.

Table 7
Plant level summary statistics—Comparison of means

	Nationality of control before ownership changes (OC) – Domestic					Nationality of control before ownership changes (OC) – Foreign				
	No ownership change	With ownership change of domestic to domestic	Significant difference	With ownership change of domestic to foreign	Significant difference	No ownership change	With ownership change of foreign to foreign	Significant difference	With ownership change of foreign to domestic	Significant difference
Number of observations	360,419	4,648	...	1,470	...	46,591	2,303	...	1,018	...
Plant knowledge intensity	0.54714	1.01625	Yes	1.00632	Yes	1.07592	1.1497	Yes	1.12151	Yes
Plant size	2.43223	5.92179	Yes	5.42967	Yes	5.67933	5.98557	No	5.75394	No
Plant number of products	1.50636	2.23859	Yes	2.13878	Yes	2.24541	2.28601	No	2.52165	Yes
Plant age	8.37777	9.04045	Yes	9.45714	Yes	9.76601	9.81806	No	9.47937	No
Unrelated plant binary variable[1]	0.02808	0.14608	Yes	0.12449	Yes	0.2033	0.26444	Yes	0.2446	Yes
Change in plant knowledge intensity	-0.059245	-0.011796	Yes	-0.019438	Yes	-0.022628	-0.012338	No	0.0019197	Yes
Change in plant size	0.000088	0.000109	No	0.00013	No	0.0001	-0.000077	Yes	-1.96E-05	No
Change in plant wage rate	0.008131	0.003175	Yes	0.00124	No	0.00424	0.001112	No	-0.002226	No
Change in plant profit rate	-0.025712	-0.0052	No	-0.006711	No	-0.00095	-0.271928	Yes	0.0508378	No
Industry relative knowledge intensity	0.905932	1.01035	Yes	1.10071	Yes	1.16683	1.20839	Yes	1.0871	Yes
Industry relative plant size	0.897271	1.47481	Yes	1.51673	Yes	1.77588	1.7493	No	1.815315	No
Industry relative wage rate	0.895811	0.953561	Yes	0.973466	Yes	0.998381	0.987941	Yes	0.9684814	Yes
Industry relative profit rate	0.851419	0.915015	Yes	0.960321	Yes	1.00164	1.00635	No	0.9715689	Yes

1. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.

Note: Variables are defined in Section 4.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

5 Regression results

5.1 All control changes

The probability of a control change is first estimated for all plants (domestic and foreign combined) over the period from 1973 to 1999. Differences between the two groups are investigated using a binary variable (*Foreign*). The coefficients and the marginal effects (evaluated at the median value of the variables) of the probit equation are provided in Tables 8 and 9. Each of the three sets of explanatory variables was added sequentially but the signs and the significance levels of the variables were generally not affected as additional variables are added. The discussion therefore, will focus only on the complete set of covariates.

All the marginal effects associated with plant-level variables are positive and significant, and generally confirm that plants undergoing control changes have the types of absorptive competencies necessary to enable takeovers that allow for the transfer of knowledge across firms. The probability of ownership change increases with age and size, variables that capture general competencies. The relationship to plant size is also compatible with the explanation that plant scale economies are behind mergers. This result is consistent with that of Nguyen and McGuckin (1993), who use a sample of U.S. manufacturing establishments. The probability of a change in control increases with the number of products produced in a plant, which is compatible with an economies-of-scope explanation. Control changes are also more likely the greater the supervisory or management labour force, thereby suggesting that knowledge intensity associated with a large white-collar work force is an important factor in determining whether a plant is a candidate for takeover.[15] Plants that are less closely related to the core business of their parent firm are more likely to experience a control change. Unrelated diversification leads to more turnovers via divestiture of plants, a result consistent with Lecraw (1984).

The pre–takeover performance change variables provide evidence that a systematic decline in the performance of a plant is associated with increases in the likelihood of takeover. Changes in the relative wage rate variable are negative and significant at the 10% level. Plants that are losing their competitiveness in the labour market are more likely to be taken over. Changes in the profit variable and in plant size are not significant.

In contrast, increases in the relative size of the non-production worker component are positively related to the probability of takeover. Acquirers not only target plants that have a relatively large professional workforce, but also focus on those plants that are improving this capability. This indicates that acquisitions take place in those plants whose knowledge base is increasingly conducive to knowledge generation.

15. It is noteworthy that a considerable number of plants report zero non-production workers and that a good portion of the magnitude of the coefficient is due to the difference in the probability of takeover between the group with no non-production workers and the group with some non-production workers.

Table 8
Pooled results

	With only plant level variables (1)				With plant level and change variables (2)			
	Probit estimate		Marginal effects at median		Probit estimate		Marginal effects at median	
Pooled	coefficient	t-statistics [4]	coefficient	t-statistics [4]	coefficient	t-statistics [4]	coefficient	t-statistics [4]
Foreign binary variable[1]	0.39022	12.77 **	0.02946	10.14 **	0.38211	12.68 **	0.02795	10.12 **
Plant knowledge intensity	0.19104	14.20 **	0.00975	10.16 **	0.21470	16.13 **	0.01067	10.75 **
Plant size	0.00776	4.94 **	0.00040	4.17 **	0.00746	4.91 **	0.00037	4.16 **
Plant age for younger plants[2]	0.01088	9.13 **	0.00056	5.71 **	0.01027	8.67 **	0.00051	5.55 **
Plant age for older plants[2]	0.01081	7.96 **	0.00055	5.02 **	0.01034	7.66 **	0.00051	4.92 **
Plant number of products	0.03326	5.31 **	0.00170	4.87 **	0.03101	5.09 **	0.00154	4.68 **
Unrelated plant binary variable[3]	0.39364	14.67 **	0.02982	8.60 **	0.38815	14.59 **	0.02856	8.55 **
Change in plant knowledge intensity					0.12632	11.26 **	0.00628	8.01 **
Change in plant size					2.46636	1.04	0.12259	1.06
Change in plant wage rate					-0.05288	-1.88 †	-0.00263	-1.83 †
Change in plant profit rate					-0.00077	-0.90	-0.00004	-0.89
Observations		416,449				416,449		
Pseudo R-squared		0.0846				0.0867		

1. Binary variable taking a value of 1 for foreign plants and 0 for domestic plants.
2. Plant age for younger plants are for those plants that came into existence after 1961. Plant age for older plants are for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.
3. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.
4. Robust t-statistics.

Note: Regression results on year dummies and the constant are not reported due to space limitations. Dependent variable takes on values of 0 or 1. Definitions for independent variables are documented in Section 4. Symbols **, * and † denote a significance level of 1%, 5% and 10% respectively. Data cells were left blank when variables were not included in the model.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Table 9
Pooled results

	With only plant level variables (3)				With plant level and change variables (4)			
	Probit estimate		Marginal effects at median		Probit estimate		Marginal effects at median	
Pooled	coefficient	t-statistics [4]	coefficient	t-statistics [4]	coefficient	t-statistics [4]	coefficient	t-statistics [4]
Foreign binary variable[1]	0.26904	9.83 **	0.01630	7.58 **	0.27331	10.10 **	0.01908	6.68 **
Plant knowledge intensity	0.21971	17.75 **	0.01007	10.72 **	0.22132	18.14 **	0.01176	8.99 **
Plant size	0.01069	5.32 **	0.00049	4.94 **	0.01073	5.31 **	0.00057	4.55 **
Plant age for younger plants[2]	0.00806	7.17 **	0.00037	4.90 **	0.00770	6.87 **	0.00041	4.58 **
Plant age for older plants[2]	0.00833	7.07 **	0.00038	4.75 **	0.00798	7.06 **	0.00042	4.59 **
Plant number of products	0.02092	3.84 **	0.00096	3.62 **	0.02038	3.92 **	0.00108	3.54 **
Unrelated plant binary variable[3]	0.36827	14.07 **	0.02470	7.67 **	0.36693	14.34 **	0.02807	7.08 **
Change in plant knowledge intensity	0.12387	10.42 **	0.00568	7.83 **	0.12359	10.24 **	0.00657	6.68 **
Change in plant size	1.33735	0.61	0.06130	0.61	1.62571	0.75	0.08639	0.75
Change in plant wage rate	-0.04602	-1.58	-0.00211	-1.55	-0.05009	-1.72 †	-0.00266	-1.67 †
Change in plant profit rate	-0.00096	-1.05	-0.00004	-1.05	-0.00093	-1.02	-0.00005	-1.03
Number of plants in industry	-0.00013	-4.45	-5.97E-06	-3.89 **	-0.00016	-5.98 **	-8.40E-06	-4.00 **
Industry relative plant size	0.00780	1.68 †	0.00036	1.67 †	0.0071	-1.55	0.00038	-1.58
Industry relative knowledge intensity	0.06654	1.34	0.00305	-1.31	0.0641	-1.22	0.00341	-1.19
Industry relative wage rate	0.33113	3.51 **	0.01518	3.38 **	0.20824	2.41 *	0.01107	2.50 **
Industry relative profit rate	0.30781	2.96 **	0.01411	3.15 **	0.23543	2.41 *	0.01251	2.61 **
Natural resource industries					-0.01345	-0.31	-0.00071	-0.30
Labour-intensive industries					-0.18909	-3.28 **	-0.00832	-2.97 **
Product-differentiated industries					-0.14036	-2.64	-0.00648	-2.47 *
Science-based industries					-0.06345	-1.05	-0.00316	-1.06
Observations	416,449				416,449			
Pseudo R-squared	0.0985				0.1009			

1. Binary variable taking a value of 1 for foreign plants and 0 for domestic plants.
2. Plant age for younger plants are for those plants that came into existence after 1961. Plant age for older plants are for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.
3. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.
4. Robust t-statistics.

Note: Regression results on year dummies and the constant are not reported due to space limitations. Dependent variable takes on values of 0 or 1. Definitions for independent variables are documented in Section 4. Symbols **, * and † denote a significance level of 1%, 5% and 10% respectively. Data cells were left blank when variables were not included in the model.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

A number of industry characteristics are significant. Plant control changes are significantly higher in industries with higher average wage rates and profits (proxies for higher capital intensity), both characteristics indicative of high knowledge intensity. In addition, the probability of control change is significantly higher when there are fewer plants in the industry (or significantly lower when there are more plants). These are also the industries where greenfield entry is less likely.

Scale-based industries (*IND3*)—the omitted sector—are most likely to have control changes along with the natural resource-based industries (*IND1*), followed by science-based industries (*IND5*), product-differentiated industries (*IND4*) and then labour-intensive industries (*IND2*). Control changes are most intensive, therefore, where scale factors or specialized assets like technological competencies or brands are important.[16]

Even after controls are included for level and change variables, foreign-owned plants are more likely than domestic owned plants to experience a control change. This is consistent with the hypothesis that these plants possess the type of assets that make them ideal takeover candidates and that there is greater churn in foreign plants because of higher thresholds for performance.

The relative importance of different variables can also be assessed by asking how the probability of takeover changes for discontinuous increases in a variable across different plants in the population, using information on the amount of variation in a particular characteristic across plants (Table 10). The increase in the probability of takeover that occurs by moving from a plant with a median value of a particular variable (e.g. age, size, etc.) to a plant with a value of that variable at the 75th percentile is presented in Table 10. For example, with respect to the variable *Age*, a plant that is nine years old is compared to a plant that is 15 years old.

The largest impact of moving across the distribution of a variable occurs for knowledge intensity. The probability of takeover increases by 44% when comparing a plant at the 50th and 75th percentile of the values of relative non-production worker intensity. *Age* also has a relatively large impact: some 11.5% for plants built after 1961 and close to 10% for those built before 1961. Movement from the median to the 75th percentile for relative plant size and the number of products has less of an impact, as do plant-change variables.

Among the industry variables, the number of plants has the largest impact on changes in the probability of takeover. Moving from the median industry characteristic in this area to the 75th percentile leads to a 14% decline in the probability of takeover. Takeovers are considerably lower in industries with lower concentration ie, those industries that have more plants. The other impacts of note are attached to industry average wage rate and relative profits (proxies for capital intensity). The probability of takeover increases by between 5% and 7% for plants whose industry capital intensity and average wage rates vary substantially.

While the coefficient on changes in wage rates indicates that the market disciplines subnormal performance in this area, large changes in this variable across plants do not have a dramatic impact on the probability of takeover—at least relative to the individual plant level and industry characteristics.

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16. The time dummies reveal that there is a pattern of reduced merger activity during the major recessions in the early 1980s and 1990s.

Table 10
Discrete effect of variables for covariate changes from value at 50th percentile to 75th percentile

Variables	Increase in probability
	percent
Plant size (average over the previous 3 years)	4.890
Plant knowledge intensity	44.377
Plant age for younger plants	11.520
Plant number of products	2.734
Change in plant knowledge intensity (from previous year)	0.103
Change in plant size (from previous year)	0.300
Change in plant wage rate (from previous year)	-0.937
Change in plant profit rate (from previous year)	-0.046
Industry number of plants	-14.127
Industry relative plant size	0.676
Industry relative knowledge intensity	3.669
Industry relative wage rate	4.692
Industry relative profit rate	6.655
Foreign binary variable[1]	85.460
Unrelated plant binary variable[2]	127.730

1. Binary variable taking a value of 1 for foreign plants and 0 for domestic plants.
2. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant whose primary activity is in another industry, and 0 otherwise.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

The impact of the two binary variables is larger relative to the continuous variables. Being a firm whose primary focus is in another industry increases the probability of takeover by 127%, while being owned by a foreign firm increases the probability of takeover by 86%. The nationality of a plant has a substantial influence on the probability of takeover.

5.2 Foreign versus domestic control changes

In order to compare the systematic differences in the correlates of ownership changes across the nationalities of the acquired plants and the acquiring firms, equation (5) is re-estimated for four different sets of transfers using the domestic/foreign ownership taxonomy (DD, DF, FD and FF). For DD and DF ownership changes, the comparison group is domestic-owned plants with no ownership changes. For FD and FF ownership changes, the comparison group is foreign-controlled plants with no ownership changes.

Comparisons of exchanges of plants from one nationality to another (DF and FD) offer a method of determining whether there are significant differences in the motivations behind control changes within both the foreign and domestic sectors. Motivations for change probably lie in the characteristics of both the acquired plants and the acquiring firms. If the former dominate, then the equation for switches from D to F and from F to D should primarily resemble those of D to D and F to F, respectively. If however, there are special factors emanating from the acquiring firms, then D to F and F to D will appear more like F to F and D to D respectively.

The respective marginal effects from the probit regressions for DD and DF are reported in Table 11. The signs and significance of the variables for pooled, as well as across the domestic/foreign dichotomy, are presented in Table 13 for ease of comparison.

5.2.1 Ownership changes from domestic to other domestic firms

The signs and coefficients of both the plant characteristics and the industry variables for the domestic sample generally resemble the results of the pooled sample, though with different magnitudes. Most of the size-based synergies present in the overall sample are also present in the domestic sample. Domestic firms tend to target domestic plants that:

- have relatively more human capital
- are larger
- have more products
- are older
- are in industries that:
    - are not core to their parent firm
    - have a high non-production worker component
    - have higher wages rates, and are more capital-intensive.

The exception is the pre-merger change in relative plant size and wage rates. In comparison to the overall sample, domestic mergers are much more likely to occur when plant size is growing, and contrary to the results for the sample as a whole, are not more likely to occur when wages are falling. The disciplining motive has therefore disappeared for the domestic group. Rather, divestiture and acquisition occur when positive signals of performance exist.

Table 11
When acquired plants are previously domestically owned

	Domestic to domestic				Domestic to foreign			
	Probit estimate		Marginal effects at median		Probit estimate		Marginal effects at median	
Domestic to domestic	coefficient	t-statistics [3]	coefficient	t-statistics [3]	coefficient	t-statistics [3]	coefficient	t-statistics [3]
Plant knowledge intensity	0.22824	14.66 **	0.00892	7.40 **	0.22526	14.37 **	0.00141	4.05 **
Plant size	0.01928	8.85 **	0.00075	5.98 **	0.01551	8.60 **	0.0001	3.67 **
Plant age for younger plants [1]	0.00650	4.19 **	0.00025	3.08 **	0.00561	3.22 **	0.00004	2.24 *
Plant age for older plants [1]	0.00753	5.28 **	0.00029	3.46 **	0.00514	3.01 **	0.00003	2.08 *
Plant number of products	0.02338	2.69 **	0.00091	2.60 **	0.00492	0.42	0.00003	-0.43 **
Unrelated plant binary variable [2]	0.48412	10.98 **	0.03177	5.23 **	0.33277	5.18 **	0.00342	2.66 **
Change in plant knowledge intensity	0.12632	8.70 **	0.00494	5.89 **	0.12202	6.42 **	0.00076	3.20 **
Change in plant size	6.56197	1.88 †	0.25651	1.91 †	3.89246	0.79	0.0244	-0.77
Change in plant wage rate	-0.00981	-0.28	-0.00038	-0 27	-0.04176	-0.65	-0.00026	-0.66
Change in plant profit rate	-0.00008	-0.17	0.00000	-0.17	0.00017	0.23	1.09E-06	-0.23
Number of plants in industry	-0.00014	-4.76 **	-0.00001	-3.05 **	-0.00024	-6.63 **	-1.47E-06	-2.99 **
Industry relative plant size	0.01025	-1.56	0.00040	-1.54	-0.00110	-0.20	-6.89E-06	-0.20
Industry relative knowledge intensity	0.01094	-0.13	0.00043	-0.13	0.06735	-1.04	0.00042	-0.97
Industry relative wage rate	0.32891	2.51 *	0.01286	2.71 **	0.44441	2.87 **	0.00279	2.90 **
Industry relative profit rate	0.37198	-3.08	0.01454	3.37 **	0.56930	4.00 **	0.00357	2.85 **
Natural resource industries	-0.04944	-0.88	-0.00183	-0.87	-0.00346	-0.04	-0.00002	-0.04
Labour-intensive industries	-0.22990	-3.08 **	-0.00703	-2.80 **	-0.14187	-1.96 *	-0.00073	-1.69 †
Product-differentiated industries	-0.21845	-3.59 **	-0.00676	-3.19 **	0.07246	1.07	0.0005	-1.08
Science-based industries	-0.08318	-1.04	-0.00297	-1.06	0.11620	1.26	0.00086	-1.17
Observations		365,067				361,889		
Pseudo R-squared		0.1018				0.1067		

1. Plant age for younger plants are for those plants that came into existence after 1961. Plant age for older plants are for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.
2. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.
3. Robust t-statistics.

Note: Regression results on year dummies and the constant are not reported due to space limitations. Dependent variable takes on values of 0 or 1. Definitions for independent variables are documented in Section 4. Symbols **, * and † denote a significance level of 1%, 5% and 10% respectively.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

5.2.2 Ownership changes from foreign firms to other foreign firms

Table 12 reports the regression results for FF and FD respectively. Many of the same characteristics that were related to DD takeovers are also associated with the takeover of foreign plants by foreign firms, although there are several significant exceptions that indicate there are differences in the motives for either divestiture or takeover.

The two variables that capture synergies relating to plant scale and plant scope opportunities matter less in the foreign sector than in the domestic sector. Plant size does not matter for FF takeovers: the relative size of the plant is negative and insignificant, while it was positive and significant for DD takeovers. This difference may arise because the average foreign plant size is already larger or because the skill set sought by foreign acquirers is more idiosyncratic. The coefficient attached to number of products is negative and insignificant for FF, while it is positive and significant for DD. The lack of significance on the number of products variable was also found in the DF category. The results for the plant size and number of product variables suggest that synergies in the foreign sector are not generated from production scale and scope economies, although this is important in the domestic sector. Foreign firms primarily use control changes to transfer knowledge rather than trying to get to the size that would allow them to exploit economies of scale and scope.

Contrary to the case for domestic to domestic takeovers, where increases in plant size presage higher probability of ownership changes, foreign to foreign takeovers occur more frequently when there is a decrease in plant size, wage rates or profit rates and all three variables are significant. These are all signals of failure. Either foreign plants that begin to fail are more likely to be divested or foreign acquirers are more likely to act as a disciplinary force. As shall be demonstrated below, similar negative coefficients exist in the FD category but not in the DF category, thereby suggesting that it is in the former (FD) where they are more likely to be divested. Deteriorating behaviour is more likely to lead foreign firms, than domestic firms, to divest plants.

5.3 Exchanges across nationalities

Exchanges of plants ownership from one nationality to another in the DF and FD categories, potentially offer a method of determining whether there are significant differences in the motivations behind control changes within the two sectors. Motivations for change probably lie in the characteristics of both the acquired plants and the acquiring firms. If the former dominate, then the equation for switches (DF and FD) should primarily resemble those of DD and FF, respectively, as reported above. If however, there are special factors emanating from the firm acquiring the plant, the two equations will appear more like FF and DD, respectively.

5.3.1 Ownership changes from domestic firms to foreign firms

A comparison of the signs and significance levels for the coefficients between DF and DD takeovers (Table 11) reveals that the characteristics of domestic plants that are divested to foreign firms are quite similar to those divested to other domestic firms. This suggests that it is the factors behind divestiture in domestic plants that dominate control changes, both to other domestic firms and to foreign firms.

Table 12
When acquired plants are previously foreign owned

	Foreign to foreign				Foreign to domestic			
	Probit estimate		Marginal effects at median		Probit estimate		Marginal effects at median	
Foreign to foreign	coefficient	t-statistics [3]	coefficient	t-statistics [3]	coefficient	t-statistics [3]	coefficient	t-statistics [3]
Plant knowledge intensity	0.07884	3.41 **	0.00634	3.47 **	0.0359	-1.51	0.00223	-1.42
Plant size	-0.00004	-0.03	0.00000	-0.03	-0.00442	-1.83 †	-0.00027	-1.74 †
Plant age for younger plants [1]	0.00507	2.48 *	0.00041	2.02 *	0.00405	-1.48	0.00025	-1.3
Plant age for older plants [1]	0.00583	3.33 **	0.00047	2.40 *	0.00367	1.76 †	0.00023	-1.47
Plant number of products	-0.00742	-1.19	-0.00060	-1.16	0.02709	2.48 *	0.00168	2.43 *
Unrelated plant binary variable [2]	0.16454	4.64 **	0.01532	3.76 **	0.09145	1.88 †	0.00619	1.68 †
Change in plant knowledge intensity	0.03921	-1.49	0.00315	-1.45	0.06559	1.83 †	0.00407	1.79 †
Change in plant size	-7.85334	-2.59 **	-0.63174	-2.35 **	-6.13357	-1.34	-0.38019	-1.27
Change in plant wage rate	-0.12933	-1.96 *	-0.01040	-1.90 †	-0.19046	-1.91 †	-0.01181	-1.83 †
Change in plant profit rate	-0.00327	-2.50 *	-0.00026	-2.18 *	0.00124	-1.05	0.00008	-1.03
Number of plants in industry	-0.00009	-2.42 *	-0.00001	-2.19 *	0.00011	-1.4	6.55E-06	-1.33
Industry relative plant size	0.00249	-0.64	0.00020	-0.65	0.00816	-1.42	0.00051	-1.39
Industry relative knowledge intensity	0.13857	2.41 *	0.01115	2.44 *	-0.00266	-0.02	-0.00016	-0.02
Industry relative wage rate	-0.19165	-2.23 *	-0.01542	-1.92 †	-0.262	-1.47	-0.01624	-1.34
Industry relative profit rate	-0.06587	-0.57	-0.00530	-0.57	-0.2723	-1.47	-0.01688	-1.34
Natural resource industries	-0.01630	-0.36	-0.00129	-0.36	0.0673	-0.69	0.00445	-0.69
Labour-intensive industries	-0.03466	-0.65	-0.00270	-0.65	0.00483	-0.05	0.0003	-0.05
Product-differentiated industries	-0.04764	-0.96	-0.00367	-0.95	-0.29004	-3.35 **	-0.0136	-2.55 **
Science-based industries	-0.0606	-1.04	-0.00462	-1.05	-0.22301	-2.11 *	-0.01115	-1.97 *
Observations		48,894				47,609		
Pseudo R-squared		0.0253				0.0311		

1. Plant age for younger plants are for those plants that came into existence after 1961. Plant age for older plants are for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.
2. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.
3. Robust t-statistics.

Note: Regression results on year dummies and the constant are not reported due to space limitations. Dependent variable takes on values of 0 or 1. Definitions for independent variables are documented in Section 4. Symbols **, * and † denote a significance level of 1%, 5% and 10% respectively.

Source: Longitudinal Manufacturing Research Database, Statistics Canada.

Similarities between DD and DF disappear for the number of products produced and the change in pre-merger plant size, both of which are significant only in DD takeovers. When evaluating domestic takeovers, therefore, foreign firms look less to scope economies and are less interested in positive signals arising from pre-merger market-share change.

5.3.2 Ownership changes from foreign firms to domestic firms

Results for FD takeovers are reported in Table 12. There are fewer significant variables in this category. Only 5 out of the 14 main covariates have significant impacts on ownership changes. These are plant size, number of products, the unrelated status variable, the change in knowledge intensity and the change in wage rates. FD takeovers share one major commonality with all other categories: plants unrelated to their parents' core business are more likely to have ownership changes.

Table 13
Summary of the results

Variables	Denotation	Pooled	Domestic to domestic	Domestic to foreign	Foreign to foreign	Foreign to domestic
Plant knowledge intensity	*Rel_NL_L*	P, S	P, S	P, S	P, S	P, NS
Plant size	*Rel_L*	P, S	P, S	P, S	N, NS	N, S
Plant age for younger plants[1]	*Age*	P, S	P, S	P, S	P, S	P, NS
Plant age for older plants[1]	*Plant_1961*	P, S	P, S	P, S	P, S	P, NS
Plant number of products	*No. of product*	P, S	P, S	P, NS	N, NS	P, S
Unrelated plant binary variable[2]	*Unrelated*	P, S	P, S	P, S	P, S	P, S
Change in plant knowledge intensity	*ΔRel_NL_L*	P, S	P, S	P, S	P, NS	P, S
Change in plant size	*ΔRel_L*	P, NS	P, S	P, NS	N, S	N, NS
Change in plant wage rate	*ΔRel_WR*	N, S	N, NS	N, NS	N, S	N, S
Change in plant profit rate	*ΔRel_PR*	N, NS	N, NS	P, NS	N, S	P, NS
Number of plants in industry	*Ind_Plant*	N, S	N, S	N, S	N, S	P, NS
Industry relative plant size	*Ind_Rel_L*	P, NS	P, NS	N, NS	P, NS	P, NS
Industry relative knowledge intensity	*Ind_Rel_NL*	P, NS	P, NS	P, NS	P, S	N, NS
Industry relative wage rate	*Ind_Rel_WR*	P, S	P, S	P, S	N, S	N, NS
Industry relative profit rate	*Ind_Rel_PR*	P, S	P, S	P, S	N, NS	N, NS
Natural resource industries	*IND1*	N, NS	N, NS	N, NS	N, NS	P, NS
Labour-intensive industries	*IND2*	N, S	N, S	N, S	N, NS	P, NS
Product-differentiated industries	*IND4*	N, S	N, S	P, NS	N, NS	N, S
Science-based industries	*IND5*	N, NS	N, NS	P, NS	N, NS	N, S

1. Plant age for younger plants are for those plants that came into existence after 1961. Plant age for older plants are for plants that came into existence in or before 1961. Since there is no information on the exact age of this group because the database starts in 1961, their age is coded starting in 1961.
2. Binary variable to capture related or unrelated merger/acquisition. It takes on value of 1 if the acquired plant is owned by a firm whose primary activity is in another industry, and 0 otherwise.

P=Positive; N=Negative; S=Significant; NS=Non-significant at 10%.
Source: Longitudinal Manufacturing Research Database, Statistics Canada.

In the case of other variables, both similarities and differences exist between FD and FF or DD that allow us to address how nationality interacts with divesting plants' characteristics.

For example, FD takeovers are inversely related to plant size, as is the case with FF takeovers. This is just the opposite of both the DD and DF categories, where domestic plants are being divested. This suggests that the size motive is related more to reasons behind divestiture than to acquisition (because the common characteristic is the divesting plant's nationality in the two pairings—(FD,FF)(DD,DF)—) and that it differs between the domestic and foreign sector. Large

domestic plants are more likely to be divested, while it is just the opposite for large foreign plants. This difference could arise if growth on the domestic side comes from having been acquired at some stage in the growth life cycle. The transition effected by a merger is less important in the foreign sector.

The second revealing pattern is that FD takeovers are positively and significantly related to plant's number of products, as they were in DD (but not in FF). This suggests the plant number of products characteristic is sought by domestic acquirers but not by foreign acquirers—reinforcing the earlier conclusion that scope economies are more likely to be a source behind domestic acquisitions than foreign acquisitions.

Finally, FD takeovers share the same set of signs on the change-in-performance categories (market share, wage rates) as FF. Control changes are more likely where there is a decline in market share and wage rate. As was the case with the FF category, a decline in wage rate is significant. Foreign plants which were shrinking and losing their competitiveness in the labour market were more likely to be divested, just as they were in the FF category. As noted above, this suggests a common tendency in foreign plants to rectify failure by divestiture.

Other differences in the FD group, in comparison to other categories, are sufficiently numerous to suggest that it is a special category. The lack of similarities suggests that there were other inherent causes of mergers in this group. FD control changes probably arose because of inherent structural changes experienced by these particular groups of plants either because of overall adjustments in the economy that resulted in a withdrawal of foreign-owned firms or because the plants so affected were themselves going through an adaptation. This means that the particular types of skills associated with multinational activity were no longer as important as they once were.[17] What is clear in this case is that domestic firms, when looking for foreign-owned plants as potential acquisition targets, often respond quite differently to signals than do Canadian-controlled plants.

5.3.3 Sectoral pattern

The coefficients on the sectoral binary variables reveal different patterns across nationality groups (Tables 11 and 12). First, none of the coefficients IND1, IND2, IND4 or IND5 are significantly different from the omitted category, IND3, for the within-sector foreign transfers. There are, however, significant differences for the within-domestic sector transfers, with the scale sector having the highest probability and the labour-intensive and product-differentiated sectors the lowest probability of being acquired.

The lack of pattern within the foreign sector group of control changes suggests that these acquisitions are idiosyncratic and depend on specific factors that are applicable either to takeover targets or to the acquirer. This idea accords with a world where unique knowledge assets are driving the acquisition process and the opportunities for control changes that are perceived by foreign players exist everywhere equally, even in sectors that are not particularly marked by the possession of knowledge assets.

17. During this period, foreign controlled firms were withdrawing from labour-intensive sectors as competition from developing nations became particularly intense in the non-durable sector. For a more detailed discussion, see Baldwin and Gellatly (2005).

On the other hand, takeovers within the domestic sector are most intense within scale-based industries, and much lower in those industries that contain many firms with intangible assets related to science-based industries or product-differentiated industries. The concentration of domestic control changes within scale-based industries reinforces the findings that domestic control changes are positively related to size, at the plant and industry level. This suggests that domestic mergers involve fewer synergistic unions based on intangible science-related or brand assets.

The variations in industry patterns where plants switch nationalities are even more suggestive of differences in the motives for control changes across nationalities. Domestic plants are acquired more frequently by foreign firms in product-differentiated and science-based industries where brand and technology assets are more important. These are the industries in which the multinational is seen to possess these intangible assets and where they are likely to be seeking opportunities to exploit these assets and do so by acquiring domestic plants.

On the other hand, foreign plants are more likely to be switched to domestic firms in the labour-intensive and natural resource-based industries. These industries were undergoing restructuring over most of the period and foreign firms were exiting this sector by divesting themselves of plants. The natural resource-based industries also underwent a restructuring during this period as foreign control fell during the restrictive regulatory regime of the Foreign Investment Review Agency (FIRA) (see Baldwin and Gellatly 2005).

6 Conclusion

This paper has examined the pattern underlying divestitures and acquisitions in the Canadian manufacturing sector in order to infer the causes behind control changes. Two hypotheses for the causes of these changes are examined. The first is managerial failure—that control changes are aimed at reversing the fortunes of failing firms. The second hypothesis is that control changes are the method used to transfer embedded assets from one firm to another and generally therefore target plants with the capacity to exploit these assets. The paper asked whether plants whose performance had deteriorated in the recent past were more or less likely to be acquired by others, and whether superior plants (measured using a range of metrics) were more or less likely to be acquired.

The findings support the failing-firm argument. For the sample as a whole, control changes were more likely to occur if the relative wage rates paid were falling. This tendency, however, originated from foreign firms rather than domestic firms and from the divestiture more than the acquisition side of the control-change process. Foreign firms are more likely to divest plants that begin to lose market share, profitability, and their capability to pay competitive wages.

Control changes do not occur just in the relatively weaker plants. On average, control changes are more likely in larger, older plants that produce more products, have a larger proportion of non-production workers; and that are in industries that have relatively higher wages and greater capital intensity. In addition, increases in the percentage of workers in the professional group are more likely to lead to control changes. All of these characteristics require a set of capabilities that are associated with managing capital-intensive production processes, relatively higher skilled workers, and a larger proportion of managers and professionals. These are the conditions

that produce a fertile ground into which embedded assets from existing firms can be propagated through control changes.

The evidence then shows that divestitures occur neither exclusively in plants that are doing poorly nor just in plants that have above-average performance. Acquirers target populations that on average provide synergies for the transfer of new ideas via control changes or that have temporarily faltered. Nevertheless, the largest impact on differences in the probability of takeover across the distribution of plants in the sample comes from differences in plant and industry characteristics, not from differences in previous performance.

This paper also examined the differences behind acquisitions and divestitures by and between firms that differ by nationality: domestic-controlled and foreign-controlled firms. The probability of takeover for a foreign plant is 85% higher than for a domestic plant, after taking into account differences in industry and plant characteristics. Foreign plants differ substantially from domestic plants in providing a receptive environment for the transmission of knowledge via takeovers.

There is also evidence that acquisitions and mergers are more likely to occur when concentration is higher, thereby supporting the view that control changes are an alternative to entry by plant creation. Interestingly, the probability of divestiture increases for those plants that are not in the core industry of their owning firm. This impact is considerable: unrelated plants are 127% more likely to experience a control change than plants located in close industrial proximity to their compatriots. In light of previous findings on the problems that unrelated diversification faces, this result accords with the failing plant hypothesis or with a recognition that there is more experimentation in some sectors of the economy via unrelated diversification and that where this experimentation is taking place, there will be more turnover via control changes.

Differences behind acquisitions and divestitures are also explored by studying whether foreign versus domestic acquirers target different sets of plants. Some similarities exist in the characteristics of plants being shifted from foreign to foreign and from domestic to domestic firms. Similar positive signs on several characteristics, such as relative plant non-production worker intensity, age of plant, change in relative non-production worker intensity, the distance a plant is from its parent's core business and the number of plants per industry, suggest that a common set of structural characteristics underlies divestitures across both groups. However, the importance of plant size of the acquired plant matters less in the foreign sector, signalling that rationalization motives related to scale and scope economies are less important here. There is also a considerable difference in short-run forces behind divestiture. Foreign plants that begin to lag in several dimensions (market share, wage rates, profitability) are more likely to be divested. On the other hand, domestic plants use the opportunity of market share gains to shift ownership to new owners.

Domestic plants have much the same characteristics, whether they are divested to domestic or foreign firms, except that foreign firms are looking for these plants more intensively within sectors whose firms possess intangible innovation and brand assets (the product differentiated and science-based sectors). This is consistent with the argument that this type of knowledge is more embedded in firms than in sectors, and that multinationals embed certain forms of knowledge whether they are in sectors where this type of knowledge is widespread across all plants, or in sectors where this is less common.

It is in the transfers from the foreign to the domestic sector that the largest differences can be found. These transfers occur more frequently in the labour-intensive and natural-resource-based sectors, where foreign firms were withdrawing from Canada over this time period. In the case of control changes in these sectors, many of the significant variables differ in a meaningful way from their counterparts in the other three categories (domestic to domestic, domestic to foreign and foreign to domestic).

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